WHITE PAPER

INTERPRETING TEST AND CALIBRATION REPORTS

July 2015

MASTER CALIBRATORS

INTRODUCTION

One of the more common questions that we get asked in regards to Calibration and HV Testing is how to interpret the reports and certificates issued. Reporting is perhaps equally as important as the actual testing or calibration procedure. It isn't just a legal requirement, but good work practice and as such, should be something that you, the user, should have an understanding of.

Everything you need to know about the condition of your equipment will be displayed on this report. This article will do its best to explain what it is that you are looking at on reports, and what it means.

CALIBRATION CERTIFICATES

These have the most information and can be the hardest to digest. The front cover provides a great deal of information about the calibration company, the instrument owner, the equipment used during the calibration, and much more.

Starting at the top of the certificate, there must be a title, the name of the organization performing the calibration, which issued this certificate, and the date of issue. There must also be be a unique certificate number, issued by the calibration company.

Under this information will be contact information for the calibration company. The name and contact details must be unambiguously clear. Next to this will be the approved signatory. Usually this will be the technician that carried out the calibration and is the individual that is authorizing the calibration certificate.

Customer details and instrument description will be next in line. Customer details should include name and address and the instrument description must include make, model and serial number. Environment conditions are self-explanatory, these are the temperature and humidity conditions that the meter was calibrated under. Directly under environmental conditions, will be a comment section. This is where the technician will make any comments that are relevant to the meter being calibrated.

Moving to the bottom of the front page now, and at this point, we are listing the Traceability information. Traceability is the unbroken record of documentation. A client's meter will of course be tested by a calibrator (or standard) and that calibrator (or standard) will need to be calibrated by another Standard and so forth. For each calibration, there must be documentation. This line of documents makes up Traceability. On calibration reports, it will be the Test Standard that was used to calibrate the clients meter. It must list the serial number, certificate number, date calibrated and the calibration period between calibrations. All this information can be presented at a moments notice if required.

The final piece of information on the front page will be the name of the technician and date that the calibration was carried out as well as a disclaimer at the bottom that highlights that the certificate complies with. We recommend a minimum of ISO10012:2003, ISO17205:2005 and ISO9001:2008

CERTIFICATE OF CALIBRATION

Issued By Mobile Test 'n' Cal

Date of Issue Tuesday, 7 July 2015

Certificate Number
PER0248

Page 1 of 4 Pages

Mobile Test 'n' Cal
79 Braddock Road
Wellard, WA, 6170
Tel: 0428 912 344
Email: perth@mobiletestncal.com.au

Approved Signatory

☐ Glen Prior ☐ Steven Prior

Customer :

Date Received :

Instrument -

System ID :	ID345
Description :	Multifunction Tester
Manufacturer :	Fluke
Model Number :	1653B
Serial Number :	
Procedure Version :	1.03

Environmental Conditions

Temperature :	20°C +/- 1°C	Mains Voltage :	240V +/- 10V
Relative Humidity :	50% +/- 10%	Mains Frequency :	50Hz +/- 1Hz

Comments

All Measured Values were within Manufacturer's Specification.
Calibration Interval is 52 weeks.

Traceability Information

Instrument description	*Serial number*	*Certificate number*	*Cal. Date*	*Cal. Period*
3200A Electrical Test Calibrator (HI)	M1360J14	UKAS 27021	3/10/2014	52
3041A Precision Multi-Product Calibrator	L1322I14	UKAS 27084	13/10/2014	52

Calibrated By : Steven Prior **Date of Calibration :** Tuesday, 7 July 2015

This certificate provides traceability of measurement to recognised National Standards, and to the units of measurement realised at the National Physical Laboratory or other recognised National Standards laboratories.

This certificate complies with the requirements of BS EN ISO 10012:2003.

The following pages will display the actual test results. The test results fall under 5 headings. Test Title, Tolerance, Applied Value, Reading, and Pass / Fail.

1. Test Title will be the title of the test. This is usually the Range of the meter that is being tested.
2. Tolerance is a value that the meter is allowed to be within. This is calculated by the calibration software and is based on the specifications outlined by the meters manufacturer.
3. Applied Value is the test value that is being applied to the meter under test.
4. Reading is the value that the meter under test is displaying.
5. Final heading is Pass / Fail. This is an overall result for that test. It has either Passed or it has Failed, based on weather the Reading, was within the specific Tolerance, of the Applied Value.

There should always be a variety of tests, conducted on each meter function and range. A reputable calibration certificate will never have only or two tests per function. This is not correctly or accurately confirming that the meter is functioning correctly and reading accurately across it's full range. Depending on the type of function and range, you should see at least three to five tests on each function and range.

At the bottom of the Test Result pages will be the uncertainties of the calibrator's applied values. It is important to mention here, that everything has uncertainty. For example, when you lift your arm to check the time on your watch, there is a certain amount of uncertainty that the time you are looking at is in fact the correct time. It might be 1 millisecond either way. Whenever there is an aspect of measurement involved, there will be a certain amount of uncertainty.

CERTIFICATE OF CALIBRATION

Certificate Number
PER0248

Test Title	Tolerance	Applied Value	Reading	Pass/Fail
AC VOLTAGE				
AC Voltage L-N				
500V AC Range	1.1V	100.0V	99.9V	Pass
500V AC Range	1.9V	200.0V	199.7V	Pass
500V AC Range	3.5V	400.0V	399.4V	Pass
AC Voltage L-PE				
500V AC Range	1.1V	100.0V	99.2V	Pass
500V AC Range	1.9V	200.0V	198.4V	Pass
500V AC Range	3.5V	400.0V	397.4V	Pass
INSULATION				
50V Range				
50V Test Voltage	5V	50.0V	53.7V	Pass
50 MOhms Range	60kΩ	1.00MΩ	1.00MΩ	Pass
50 MOhms Range	180kΩ	5.00MΩ	4.96MΩ	Pass
50 MOhms Range	330kΩ	10.00MΩ	10.03MΩ	Pass
50 MOhms Range	780kΩ	25.00MΩ	25.04MΩ	Pass
50 MOhms Range	1.5MΩ	49.00MΩ	49.03MΩ	Pass
100V Range				
100V Test Voltage	10V	100.0V	102.6V	Pass
20 MOhms Range	60kΩ	1.00MΩ	1.00MΩ	Pass
20 MOhms Range	180kΩ	5.00MΩ	5.01MΩ	Pass
20 MOhms Range	330kΩ	10.00MΩ	10.00MΩ	Pass
20 MOhms Range	600kΩ	19.00MΩ	19.00MΩ	Pass
100 MOhms Range	1.8MΩ	50.0MΩ	49.5MΩ	Pass
100 MOhms Range	2.4MΩ	70.0MΩ	69.6MΩ	Pass
100 MOhms Range	3MΩ	90.0MΩ	89.0MΩ	Pass
250V Range				
250V Test Voltage	25V	250.0V	256.5V	Pass
20 MOhms Range	45kΩ	1.00MΩ	1.00MΩ	Pass
20 MOhms Range	105kΩ	5.00MΩ	5.02MΩ	Pass
20 MOhms Range	180kΩ	10.00MΩ	10.02MΩ	Pass
20 MOhms Range	315kΩ	19.00MΩ	19.00MΩ	Pass
200 MOhms Range	1.1MΩ	50.0MΩ	49.6MΩ	Pass
200 MOhms Range	1.8MΩ	100.0MΩ	99.2MΩ	Pass
200 MOhms Range	2.6MΩ	150.0MΩ	148.6MΩ	Pass
200 MOhms Range	3.2MΩ	190.0MΩ	188.5MΩ	Pass
500V Range				
500V Test Voltage	50V	500.0V	515.3V	Pass

Uncertainties

A.C. Voltage	0 to 1000V: 0.01% ± 1digit
Insulation Ohms	10kohms to 5Mohms: 0.1%, 5Mohms to 10Gohms: 1% +/- 1 Digit.
Insulation Voltage	1% ± 800mV
Resistance	0 to 10MOhms 0.005% ± 1digit: 10Mohms to 1Gohm 0.4% ± 1 digit
Loop Impedance	0.5% + 0.004 Ohms ± 1 digit
RCD Current	1.2%
RCD Time	0.7ms

CERTIFICATE OF CALIBRATION

Certificate Number
PER0248

Test Title	Tolerance	Applied Value	Reading	Pass/Fail
20 MOhms Range	45kΩ	1.00MΩ	1.00MΩ	Pass
20 MOhms Range	105kΩ	5.00MΩ	5.02MΩ	Pass
20 MOhms Range	180kΩ	10.00MΩ	10.00MΩ	Pass
20 MOhms Range	315kΩ	19.00MΩ	19.03MΩ	Pass
200 MOhms Range	1.1MΩ	50.0MΩ	49.4MΩ	Pass
200 MOhms Range	1.8MΩ	100.0MΩ	99.0MΩ	Pass
200 MOhms Range	3.2MΩ	190.0MΩ	188.2MΩ	Pass
500 MOhms Range	25MΩ	250MΩ	248MΩ	Pass
500 MOhms Range	49MΩ	490MΩ	483MΩ	Pass
1000V Range				
1000V Test Voltage	100V	1 000.0V	1 021.0V	Pass
200 MOhms Range	450kΩ	10.0MΩ	10.0MΩ	Pass
200 MOhms Range	1.1MΩ	50.0MΩ	49.3MΩ	Pass
200 MOhms Range	1.8MΩ	100.0MΩ	98.6MΩ	Pass
200 MOhms Range	3.2MΩ	190.0MΩ	188.0MΩ	Pass
1000 MOhms Range	30MΩ	300MΩ	296MΩ	Pass
1000 MOhms Range	50MΩ	500MΩ	491MΩ	Pass
1000 MOhms Range	70MΩ	700MΩ	685MΩ	Pass
1000 MOhms Range	99MΩ	990MΩ	965MΩ	Pass
CONTINUITY				
20 Ohm Range	45mΩ	1.00Ω	1.00Ω	Pass
20 Ohm Range	180mΩ	10.00Ω	9.97Ω	Pass
200 Ohm Range	1.8Ω	100.0Ω	99.5Ω	Pass
2000 Ohm Range	18Ω	1 000Ω	997Ω	Pass
LOOP IMPEDANCE				
20 Ohm Range	164.1mΩ	2.14Ω	2.19Ω	Pass
20 Ohm Range	178.9mΩ	2.63Ω	2.71Ω	Pass
20 Ohm Range	298.3mΩ	6.61Ω	6.76Ω	Pass
20 Ohm Range	448.2mΩ	11.61Ω	11.84Ω	Pass
200 Ohm Range	3.1Ω	102.4Ω	104.1Ω	Pass
2000 Ohm Range	59.7Ω	995Ω	999Ω	Pass
RCD TEST				
RCD Trip Current x5				
10mA Range	5mA	50.0mA	52.8mA	Pass
30mA Range	15mA	150.0mA	159.7mA	Pass
100mA Range	50mA	500.0mA	530.4mA	Pass

Uncertainties

A.C. Voltage	0 to 1000V: 0.01% ± 1digit
Insulation Ohms	10kohms to 5Mohms: 0.1%, 5Mohms to 10Gohms: 1% +/- 1 Digit.
Insulation Voltage	1% ± 800mV
Resistance	0 to 10MOhms 0.005% ± 1digit: 10Mohms to 1Gohm 0.4% ± 1 digit
Loop Impedance	0.5% + 0.004 Ohms ± 1 digit
RCD Current	1.2%
RCD Time	0.7ms

CERTIFICATE OF CALIBRATION

Certificate Number
PER0248

Test Title	Tolerance	Applied Value	Reading	Pass/Fail
RCD Trip Current x½				
10mA Range	500uA	5.0mA	4.8mA	Pass
30mA Range	1.5mA	15.0mA	14.5mA	Pass
100mA Range	5mA	50.0mA	48.4mA	Pass
300mA Range	15mA	150.0mA	143.3mA	Pass
500mA Range	25mA	250.0mA	242.0mA	Pass
1000mA Range	50mA	500.0mA	487.2mA	Pass
RCD Trip Current x1				
10mA Range	1mA	10.0mA	10.6mA	Pass
30mA Range	3mA	30.0mA	31.8mA	Pass
100mA Range	10mA	100.0mA	105.4mA	Pass
300mA Range	30mA	300.0mA	319.0mA	Pass
500mA Range	50mA	500.0mA	531.2mA	Pass
1000mA Range	100mA	1 000.0mA	1 060.2mA	Pass
RCD Trip Time				
40mS Range @ 0°	4ms	40.0ms	40.0ms	Pass
100mS Range @ 0°	10ms	100.0ms	100.0ms	Pass
40mS Range @ 180°	4ms	40.0ms	40.5ms	Pass
100mS Range @ 180°	10ms	100.0ms	100.6ms	Pass
EARTH RESISTANCE				
200 Ohms Range	900mΩ	20.0Ω	20.0Ω	Pass
200 Ohms Range	2.5Ω	100.0Ω	100.2Ω	Pass
2000 Ohms Range	45Ω	1 000Ω	999Ω	Pass

End of Tests

Uncertainties

A.C. Voltage	0 to 1000V: 0.01% ± 1digit
Insulation Ohms	10kohms to 5Mohms: 0.1%, 5Mohms to 10Gohms: 1% +/- 1 Digit.
Insulation Voltage	1% ± 800mV
Resistance	0 to 10MOhms 0.005% ± 1digit: 10Mohms to 1Gohm 0.4% ± 1 digit
Loop Impedance	0.5% + 0.004 Ohms ± 1 digit
RCD Current	1.2%
RCD Time	0.7ms

EQUIPMENT TESTING

Equipment Test reports are a bit easier to follow, as there is less information to digest. Starting at the top of the report will be the Title as well as the Testing Company's contact details.

There will also be a note referencing the National Standard or any relevant document/s that the equipment is being tested to. The exception is when one test report contains various tests, all conducted to different standards. When this is the case, the reference standard may be listed on the test line. This approach is often taken for HV Testing of Safety Equipment or inspection of Rigging and Lifting Equipment because there are a very large variety of Standards / Documents that could be referenced for Electrical Safety Equipment. For other equipment, such as EWP's or Height Safety Equipment, there are one or two overarching Standards that cover the testing procedure. For Electrical Safety Equipment, the number of Standards used and referenced is much higher.

Next on the report will be the details of the client. This will include name, address, contact details, date tested, date due and a unique Job Number. Any comments are also be added here. Equipment Traceability will be listed directly under the client's details. This is the information of the equipment the Tester has used to test the equipment.

The remainder of the test report will be the actual test results. This will include but not limited to Asset ID, Item Description, Visual inspection, Test Voltage in kV, leakage results in mA and an overall Pass / Fail result.

1. Asset ID is an individual and unique identifying ID number (or name) assigned to that item, and that item only. It allows test results to be tied back to a particular item.
2. Item Description gives a brief description of the item being tested. It should be descriptive and use commonly accepted industry terminology.
3. Visual inspection field is a simple yes or no option. If the item is in good working order visually, this will receive a tick. It is visually unfit or unsafe for use, no tick will be given and the item will fail on visual grounds. No further electrical test are performed.
4. Test Voltage in kV shows the Test Voltage that is applied to Electrical Safety Equipment during the electrical test. This is usually as defined by the Standard, however sometimes best practice or client requirements dictate a higher test voltage. Be very careful if you are using a testing service provider who does not put a test voltage – they may not be performing an electrical test at all and purely performing a visual inspection.
5. Leakage Results in mA are given as a means of measuring the level of insulation provided by the item, and to a lesser extent for monitoring equipment degradation over time. Again, we urge you to be very careful if you are using a testing service provider who does put a leakage current – they may not be performing an electrical test at all and purely performing a visual inspection.
6. Pass / Fail result in most cases is based on whether the piece of equipment under test withstood the test voltage for the test period. If it withstood the test without a puncture, it will Pass. For some items, even if it has withstood the test and not punctured, but the leakage reading is above acceptable limits (taken from the applicable Standard) it may also be deemed as a Fail.

All Test Reports must be finalized with the name and signature of the trained technician who conducted the testing

MOBILE TEST'N'CAL

ELECTRICAL SAFETY EQUIPMENT TEST REPORT

Tests performed in accordance with the relevant corresponding Standard or Document as listed beside the item

1300 662 119

sales@mobiletestncal.com.au

www.mobiletestncal.com.au

Customer				Date	
Address					
Contact No.		PO#		Job No.	
Comments					
				Next Test Due	

Test Equipment Traceability	

Asset ID	Item Description	Standard / Document	Class	Visual	Test Voltage in kV	Leakage in mA/Time	Pass/Fail

Tested By		Signature	

We certify that all tests have been performed to the applicable standards and/or regulations

Our Quality Management System complies with AS/NZS ISO 9001:2009

Quality, Convenience, Compliance...

CONCLUSION

Hopefully this document has offered a clearer understanding on how reporting systems work. Master Calibrators are the leading authority in HV Testing, Calibration and Inspection best practice in the Electrical Industry.

MASTER CALIBRATORS